Low-Level Radioactive Waste in Michigan

A Survey of Radioactive Waste Generators

State of Michigan
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Statutory Basis

Section 18(a) of the Low-Level Radioactive Waste Authority Act, 1987 PA 204, as amended (Act 204), requires generators of low-level radioactive waste (LLRW) to annually report to the Michigan Low-Level Radioactive Waste Authority (Authority) certain information on the volume, type, and activity of the LLRW produced. Based on a survey conducted in 2007, this report is a summary of the information submitted by generators for calendar year 2006.

Introduction

Commercial LLRW is a by-product of radioactive materials used in nuclear power plants, industry, and medical and research institutions. It comes in very diverse forms, including laboratory equipment, sealed radiation sources, wiping rags, protective clothing, hand tools, vials, needles, filter resins, and metallic reactor components.

Through the 1970s and 1980s, only three disposal facilities in the nation were licensed to accept commercial LLRW. The states in which these facilities were located (Nevada, South Carolina, and Washington) did not want to continually bear sole responsibility for the nation's LLRW and urged Congress to take action to avoid a disposal capacity crisis. The resulting federal Low-Level Radioactive Waste Policy Act of 1980, and the Policy Amendments Act of 1985, established the requirement that each state, acting alone or in cooperation with other states through an interstate "compact," is responsible for providing disposal capacity for the LLRW produced within its borders.

The Authority was established by Act 204 to fulfill the state's responsibility under federal law to provide for the careful isolation of the LLRW produced by Michigan's hospitals, universities, industry, and nuclear power plants.

In 1994 the Michigan Legislature enacted amendments to Act 204, requiring that generators report annually to the Authority on the volume of waste being produced and in storage and other information on the generation and management of LLRW. The Authority is required to provide a report to the Legislature summarizing the results of the data received from waste generators. The generator survey and this report fulfill the reporting requirements of Act 204.

The survey conducted in 2007, seeking data on calendar year 2006 waste management practices and volumes, included only those 39 facilities identified in the last survey as waste generators or waste storers, along with a small number of new facilities that had not been licensed or registered during prior surveys. This report summarizes the findings for calendar year 2006.

Survey Results

Michigan Waste Generators

The data presented in Table 1 summarize the responses of the 27 facilities that reported they generated LLRW in 2006, along with two other facilities that were still storing wastes previously generated, but not currently generating waste. Those facilities can be summarized as follows:

Table 1 – **Summary of Responses by Facility Type**

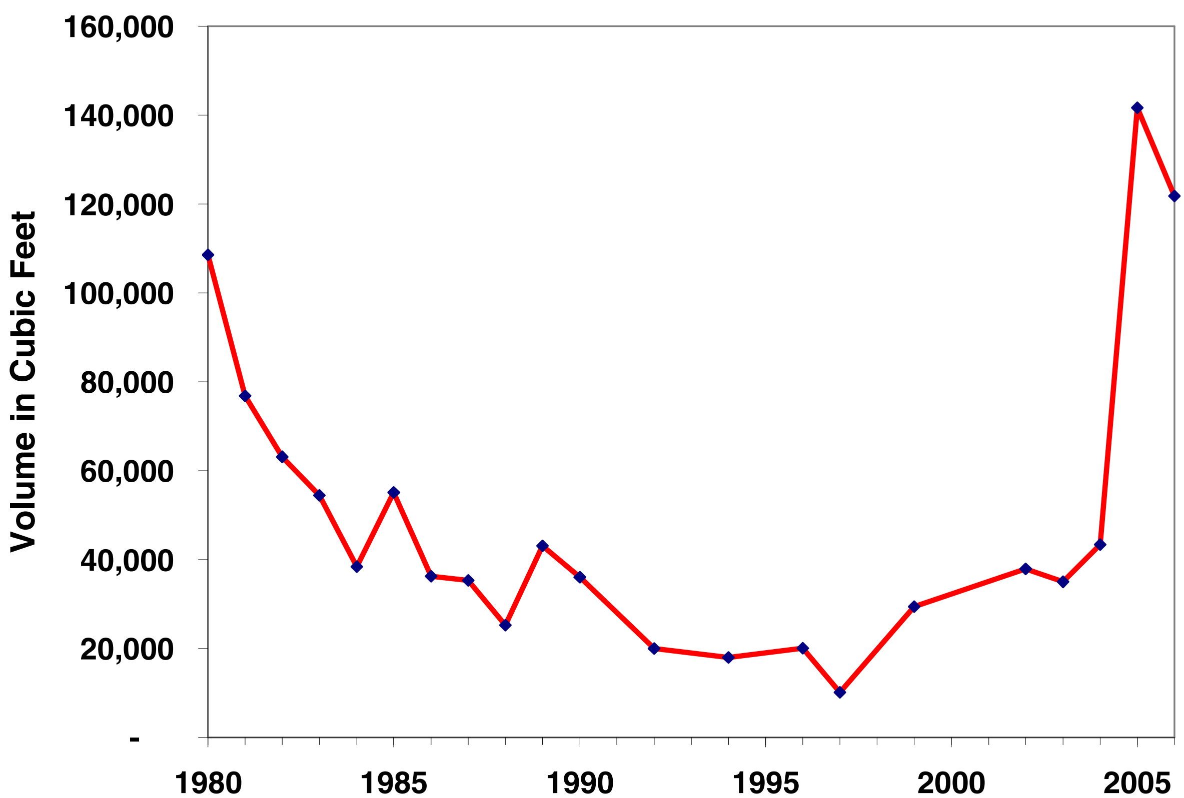
Type of Generator	**Generating LLRW**	**Storing LLRW**
Academic	7	1
Government	2	0
Industry	10	1
Medical	4	0
Utility	4	0
Total	**27**	**2**

Appendix A provides a listing of the facilities included in this Table.

Figure 1 shows Michigan's annual waste generation volumes. The dramatic increase seen in the last few years has been due to several special projects in the state. The decommissioning of the Big Rock Point Nuclear Power Plant produced significant quantities of material that must be treated as LLRW. Decommissioning was completed in 2006. Two other decommissioning projects are currently under way at the University of Michigan's Ford Reactor and Detroit Edison's Fermi I reactor. Table 3 (next page) shows that these volumes will likely decline significantly in the next couple years.

The 2006 data does not include waste volumes reported by Big Rock Point. During the final phase of demolition (2006), Big Rock generated 440,000 cubic feet of soil and rubble from building foundations. This material was shipped to a Duratek facility in Tennessee for sorting. By U.S. Nuclear Regulatory Commission (NRC) regulations, the rubble was required to be classified as LLRW although most of this material was determined to be uncontaminated. In accordance with NRC regulations, and regulations of the state of Tennessee, most of this rubble was disposed in a solid waste landfill.

Figure 1
Annual Waste Volumes for Michigan: 1980-2006
(Data not available for all years)



Waste Generation in 2006

Table 2 indicates the volume of waste, by generator category and waste class, which was generated in 2006. The data show that nuclear utilities generate the majority of Michigan's LLRW.

Table 2 – **LLRW Generated in Calendar Year 2006 Requiring Disposal in a Licensed Facility**

Type of Generator	Number of Generators	Cubic Feet Produced in 2006	Percent	Class A Waste	Class B Waste	Class C Waste	Mixed Waste
Academic	7	2,540	2.1%	2,405	0	20	115
Government	2	15	<0.1%	15	0	0	0
Industry	10	11,490	9.4%	11,435	0	0	55
Medical	4	29	<0.1%	29	0	0	0
Utility	4	107,734	88.4%	105,553	200	1,973	8
Total	**27**	**121,808**	**100%**	**119,437**	**200**	**1,993**	**178**

Trends in Generation Rates Over the Next Five Years

Table 3 reflects survey respondents' estimates of their annual waste generation rate for each of the next five years. Eight of the facilities answered that they anticipate generating waste in the future, although they did not generate waste in 2006.

Table 3 – **Volume of Waste (cubic feet)**

Type of Generator	2006	2007	2008	2009	2010	2011
Academic	2,540	27,983	2,280	2,282	2,147	2,150
Government	15	34	16	16	16	16
Industry	11,490	2,368	638	528	513	513
Medical	29	21	27	31	36	41
Utility	107,734	51,760	35,570	49,850	40,020	40,650
Total	**121,808**	**82,166**	**38,531**	**52,707**	**42,732**	**43,370**

Waste Streams

Survey respondents were asked to provide the volume and activity for the different types of wastes that were generated in 2006. Table 4 indicates the volume and activity for a variety of waste types or "streams." The most significant of these waste streams (in volume or activity) are described in the following paragraphs. A description of all of the waste streams is included in Appendix B.

Table 4 – **Volumes and Activity by Waste Stream**

Waste Stream	**Volume (Cubic Feet)**	**Percent of Volume**	**Activity (millicuries)**	**Percent of Total Activity**
Dry Active Waste	115,998	95.2%	436,376	26.8%
Medical Generators	0	0.0%	0	0.0%
Aqueous Liquids	898	0.7%	10,157	0.6%
Organic Liquids	177	0.1%	128,268	7.9%
Oils	62	<0.1%	193	<0.1%
Animal Carcasses	60	<0.1%	38	<0.1%
Biological Waste (Not Animal Carcasses)	252	0.2%	25	0.0%
Ash	15	<0.1%	40	<0.1%
Activated Equipment	43	<0.1%	795,859	48.8%
Contaminated Hazardous Material	48	<0.1%	1	<0.1%
Rubble, Sand, and Soil	0	0.0%	0	0.0%
Sludge	0	0.0%	0	0.0%
Evaporator Concentrates	37	<0.1%	1	<0.1%
Air Filter Media, Cartridges	0	0.0%	0	0.0%
Liquid Filter Media, Cartridges	56	<0.1%	5,420	0.3%
Ion Exchange Resins	3,972	3.3%	250,555	15.4%
Sealed Sources	190	0.2%	2,860	0.2%
Total	**121,808**	100%	**1,629,793**	100%

Dry active waste (DAW) consists of protective clothing, glassware, wiping rags, and other materials that may have been in contact with radioactive material and, thus, became contaminated with small amounts of radioactivity. DAW usually is the waste stream generated in the greatest volume. The curie content of DAW is usually very low relative to volume.

Ion exchange resins are filtration materials used in nuclear power plants to remove radioactive contaminants from circulating cooling water. Resins often form the second or third largest waste category in terms of both volume and activity. In this survey, resins account for the majority of total curies, primarily because the volume and curie content of the activated equipment, though appreciable, was lower than in many previous surveys.

Activated equipment or shielding are metal components from within a nuclear reactor or spent fuel pool. By being exposed to the radiation, these materials became radioactive themselves. While this waste category is usually small in volume, it often can contribute a significant percentage of the curie content in the total waste stream.

Volume in Storage

Generators were asked to identify the volume of waste currently in storage. Most generators will store waste for some period of time prior to disposal. Smaller waste generators may store waste for significant periods of time prior to shipping for disposal in order to have a quantity of waste that is economical to ship. Table 5 indicates, by generator category, the number of facilities reporting waste in storage and the volume of waste in storage.

Table 5 – **Volume of Waste in Storage**

Type of Generator	Facilities Reporting Waste in Storage	Cubic Feet LLRW in Storage	Class A Waste	Class B Waste	Class C Waste	Mixed Waste
Academic	9	618	600	0	0	18
Government	0	16	16	0	0	0
Industry	7	245	240	2	0	3
Medical	5	26	26	0	0	0
Utility	3	16,765	16,685	0	80	0
Total	**24**	**17,670**	**17,567**	**2**	**80**	**21**

The volumes of waste in storage cited above do not include waste volumes stored for decay. Decay in storage (DIS) is a management practice that can be used for wastes involving radionuclides that have relatively short half-lives (usually less than 90 days). Safely storing such wastes for a sufficient period of time results in a material that can be considered nonradioactive. Many clinics and other medical facilities practice DIS. However, because these wastes do not require disposal in a licensed LLRW facility, these facilities, and their wastes, are not included in this report.

Volume of Waste Disposed in 2006

Table 6 reflects, by generator category, the number of facilities that shipped waste for disposal during 2006, the waste volume as disposed, and the final destination of the waste. Certain waste types were shipped to other facilities besides the two land disposal facilities. For instance, there are several companies that provide for the incineration of aqueous liquids.

The "as disposed" volume figures reflect the volume of waste actually placed in the land disposal facility. Many waste streams can be significantly reduced in volume through treatment and processing prior to burial. Thus, the volumes reflected in this table are smaller than the volumes generated.

Table 6 – **Volume of Waste Disposed in 2006 (in Cubic Feet)**

Type of Generator	Generators Shipping for Disposal in 2006	Volume of Waste Disposed	Volume Shipped to Barnwell, SC	Volume Shipped to Clive, UT	Other Facilities (or Site Not Identified)
Academic	3	660	20 (1)	47 (2)	78 (1)
Government	1	15	5 (1)	0 (0)	0 (0)
Industry	5	10,784	9,636 (3)	17 (1)	98 (2)
Medical	1	1	0 (0)	0 (0)	1 (1)
Utility	4	58,472	777 (3)	51,842 (4)	0 (0)
Total	**14**	**69,932**	**10,438 (8)**	**51,906 (7)**	**177 (4)**

* Numbers in parentheses indicate the number of generators that shipped to a particular site. Some generators shipped to more than one site.

Other Waste Management Methods

The survey asked respondents to identify the various waste management methods that were used at their facilities. Table 7 presents the results. It should be noted that many facilities indicate that more than one management method is used.

Table 7 – **Waste Management Methods**

Waste Management Methods	Number of Respondents
Decay to background	24
Return to manufacturer	19
On-site incineration	2
Off-site incineration	11
Controlled release off-site to air, water, or sanitary sewer pursuant to NRC regulations	13
Refrigerated or frozen awaiting licensed disposal facility	3
Noncompacted awaiting licensed disposal facility	12
Compacted awaiting licensed disposal facility	9
Solidified awaiting licensed disposal facility	5
Dewatered awaiting licensed disposal facility	4
Curtailment of LLRW generation (elimination or substitution of activities previously generating LLRW)	14
Off-site treatment with return for storage	2
Brokerage storage for decay	5
"Green is Clean"	3
Other	4

Decay to Background: Hospitals, universities, and research institutions often use radionuclides with relatively short half-lives. The NRC permits wastes containing radionuclides with half-lives of up to 90 days or less to be stored until the radioactivity has decayed to background--a period recognized as being equal to ten half-lives for any particular radionuclide. Almost all universities and medical facilities indicated that some wastes were stored for decay.

Return to Manufacturer: A "sealed source" is a radioactive material sealed in a container to prevent contact with, or dispersion of, the radioactive material. Sealed sources are used in a variety of different ways in medical treatment and in industrial and manufacturing processes. Examples include devices used to examine welded joints, to test the thickness of paper, and to control fluid levels in bottling plants. Sealed sources are often returned to the manufacturer after the radionuclide source has decayed.

On-site Incineration: Facilities may be licensed to incinerate certain waste material under strict limits imposed by the NRC. Three licensees incinerate some of their LLRW on-site. The resulting ash is treated as LLRW.

Off-site Incineration: There are several commercial LLRW incinerators operating elsewhere in the country. The resulting ash is treated as LLRW. Ash may be solidified to avoid dispersal problems. Scintillation fluids (chemical solutions often used in biomedical research) are often incinerated, leaving no residual waste.

Controlled Release to Air, Water, or Sanitary Sewer: NRC regulations allow for the discharge of small concentrations of radionuclides to the air, water, or sanitary sewage systems. The concentration limits established by the NRC for such releases are very conservative. For instance, the concentrations for sewer release are set so that a person would get no more than 500 millirem of exposure in a year if the sewer discharge was the person's only source of drinking water.

Refrigerated or Frozen: Biological wastes, particularly animal carcasses used in laboratory experiments, are often frozen to forestall biological deterioration if disposal is not possible or delayed. Hospitals, universities, and research institutions may use this technique.

Noncompacted Awaiting Licensed Disposal: Many waste generators, particularly the small quantity generators, simply containerize their wastes in drums until disposal is available. The waste materials are dry solids.

Compacted Awaiting Licensed Disposal: Some waste generators use compactors to reduce the volume of dry solid wastes. Generators may have their own compactor or send waste to a commercial compactor for treatment and return.

Solidified Awaiting Licensed Disposal: Some liquid or wet wastes can be solidified by the use of concrete, asphalt, or epoxies. The resulting waste form is more stable; however, often the volume is increased substantially through the addition of the solidifying agent. Liquid wastes are not permitted in licensed LLRW disposal facilities.

Dewatered Awaiting Licensed Disposal: Ion exchange resins used in nuclear power plants to remove radioactive contaminants from circulating cooling waste are often "dewatered" or dried prior to being placed into storage or sent for disposal.

Curtailment of LLRW Generation: Over the past decade, the volume of LLRW being generated has declined significantly, due to better waste management practices, new waste treatment technologies, and eliminating or substituting activities or procedures that would generate LLRW. Due to the uncertainty of disposal and the cost of both storage and disposal, most waste generators continue to search for ways to reduce the amounts of LLRW being produced.

Off-site Treatment with Return for Storage: Some waste generators will have certain wastes processed into a more stable or compact waste form, but have wastes returned for storage rather than shipped for immediate disposal. This was practiced by many generators during the years when generators had no access to disposal facilities.

Brokerage Storage for Decay: Some wastes with radionuclides of short half-lives can be stored until decayed. If a generator has no space to store waste for decay, waste can be sent to a brokerage for storage. After the radionuclides have sufficiently decayed, the material can be disposed as nonradioactive waste.

Green is Clean: Waste initially classified as LLRW can be shipped to a waste processor for radiological assessment. If determined to be uncontaminated, or showing only trace or background levels of radioactivity, such waste can be sent to a regular solid waste landfill.

Brokerage Services

Survey respondents were asked whether or not a brokerage service was used to manage their LLRW. A brokerage service usually picks up waste from a variety of waste generators and then properly packages, manifests, and ships the waste for disposal. The brokerage service may also provide some waste treatment or processing or send it to a third party for processing prior to disposal.

Most LLRW generators made use of brokerage services. Of 39 respondents, 29 indicated that a brokerage service was used for some portion of their overall waste management scheme.

Off-Site Waste Treatment and Processing

Generators were also asked to identify any commercial waste treatment or processing companies (separate from brokerage services) that were used to treat wastes prior to disposal. Nuclear power plants utilize waste treatment and processing more than other generators. The four nuclear power plants each indicated that a variety of commercial waste treatment and processing services were used to volume-reduce and stabilize their LLRW.

Table 8 indicates the number of facilities, by type of generator that indicated employment of a waste brokerage and/or off-site waste processor to help manage LLRW.

Table 8 – **Use of Waste Management Services**

Type of Generator	Number of Generators Utilizing Brokerage Services	Number of Generators Utilizing Off-Site Waste Treatment
Academic	9	4
Government	3	1
Industry	9	6
Medical	5	3
Utility	3	4
Total	**29**	**18**

The Future of LLRW Disposal

Currently there are only two facilities that accept Michigan LLRW for disposal. The Barnwell facility in South Carolina is the only facility that accepts Class B and C wastes from the majority of states, including Michigan. Under South Carolina law, this facility will no longer accept LLRW from states other than the states of its three-state compact after June 2008.

The loss of access to the Barnwell facility may pose problems for generators across the country in the disposal of Class B and C wastes. Generators in Michigan and 35 other states will have to store such wastes or take steps to avoid generating them.

Class B and C wastes form only a small percentage of the overall LLRW waste stream. The generation of some Class B and C wastes, such as activated reactor hardware, cannot be avoided. Other wastes that sometimes fall within Class B or C limits can be avoided. For instance, a batch of filter resins used in nuclear power plants can become Class B or C waste if used over a significant time period. If replaced earlier, the material can meet Class A limits. While avoiding the creation of Class B or C wastes, such a strategy results in the creation of greater overall volumes of LLRW.

A 2004 report by the U.S. General Accounting Office reached the following conclusion regarding the management of Class B and C wastes: "If disposal conditions do not change…most states will not have a place to dispose of their Class B and C wastes after 2008. Nevertheless, any disposal shortfall that may arise is unlikely to pose an immediate problem because generators can minimize, process, and safely store wastes."[1] The report does acknowledge that long-term storage of ever-increasing volumes of such wastes may result in increased safety and security risks.

No shortfall is foreseen in the availability of adequate disposal capacity for Class A wastes.

[1] "Low-Level Radioactive Waste: Disposal Availability Adequate in the Short-term, but Oversight Needed to Identify Any Future Shortfalls," U.S. General Accounting Office; June 2004

Appendices

Appendix A

2006 Low-Level Radioactive Waste Generator Survey Respondents

Colleges/Universities	County	Generating LLRW	Storing Only	Future Generating
Kettering University	Genesee		x	
Michigan Technological University	Houghton			x
Michigan State University	Ingham			x
Central Michigan University	Isabella			x
Western Michigan University	Kalamazoo	x		x
Calvin College	Kent	x		x
Northern Michigan University	Marquette			x
Oakland University	Oakland	x		x
Eastern Michigan University	Washtenaw	x		x
University of Michigan	Washtenaw	x		x
Children's Hospital of Michigan	Wayne	x		x
Wayne State University	Wayne	x		x
Government				
U.S. Army TACOM	Macomb	x		x
U.S. Department of Commerce	Washtenaw			x
VA Ann Arbor Healthcare System	Washtenaw	x		x
Hospitals/Medical Centers				
Henry Ford Bi-County Hospital	Macomb			x
Cardinal Health	Oakland	x		x
William Beaumont Hospital	Oakland			x
Cardinal Health (location 11)	Ottawa	x		x
Henry Ford Hospital	Wayne	x		x
Henry Ford Wyandotte Hospital	Wayne			x
Karmanos Cancer Institute	Wayne	x		
Industry				
Kinnco, Inc.	Grand Traverse		x	
Pharmacia & Upjohn Company	Kalamazoo	x		x
General Motors Corporation	Macomb	x		x
The Dow Chemical Company	Midland	x		x
Mahle Engine Components	Muskegon	x		x
Radparts.com	Shiawassee	x		x
Aastrom Biosciences, Inc.	Washtenaw	x		x
Cayman Chemical Company	Washtenaw	x		x
Esperion Therapeutics, Inc.	Washtenaw	x		
MIR Preclinical Services	Washtenaw			
Pfizer Global Research and Development	Washtenaw	x		x
TSRL, Inc.	Washtenaw	x		x
Lakeshore Engineering Services, Inc.	Wayne			
Nuclear Power Plants				
D.C. Cook	Berrien	x		x
Detroit Edison - Fermi 2	Monroe	x		x
Fermi 1	Monroe	x		x
Palisades	Van Buren	x		x
Big Rock Point *	Charlevoix			

* The Big Rock Point (BRP) decommissioning project was completed in 2006. Because of the project's large volume of mostly uncontaminated waste, BRP's volume figures are not included in the report tables.

Appendix B

Description of Waste Classes and Waste Streams

Waste Classes

Class A: LLRW that has the largest volume but lowest concentrations of long-lived and/or short-lived radionuclides. Most Class A waste decays to a level that no longer poses a hazard within 100 years. Class A waste includes most LLRW from hospitals and universities and the majority of waste from nuclear power plants.

Class B: LLRW that has small volumes but intermediate concentrations of long-lived and/or short-lived radionuclides. Class B wastes must meet more rigorous waste form requirements than Class A to ensure stability. Most Class B waste decays to a level that no longer poses a hazard within 100 to 300 years. Class B waste can include certain radiopharmaceutical wastes, sealed sources, and some ion exchange resins from nuclear power plants.

Class C: LLRW that has the smallest volumes but the highest concentrations of long-lived and/or short-lived radionuclides. Class C wastes must meet more rigorous waste form requirements to ensure stability and must be disposed of at a depth of at least five meters below the surface or be disposed of with intruder barriers. Most Class C waste decays to a level that no longer poses a hazard within 500 years. Class C waste is limited almost exclusively to some ion exchange resins, some sealed sources, and activated metal components from nuclear power plants.

It is important to note that all of the waste classes can contain radionuclides with long half-lives. It is the concentration of the radionuclides within a waste material, more than the half-life of the radionuclides present, which often determines the class of waste.

Mixed Waste: Waste material that contains radioactive constituents, as defined under Title 10of the Code of Federal Regulations, Part 61, Licensing Requirements for Land Disposal of Radioactive Waste, and hazardous constituents, as defined under federal hazardous waste rules in Title 40 of the Code of Federal Regulations, Part 261, Identification and Listing of Hazardous Waste. Both the radiological and chemical hazard of the mixed waste must be considered in the management and disposal of this waste.

Waste Streams

Activated Equipment (or Shielding): Tools, instruments, equipment, and lead shielding made radioactive by irradiation from a nuclear reactor or spent fuel pool.

Air Filter Media, Cartridges: Air filters or the media used within air filters, such as charcoal or cellulose fibers.

Animal Carcasses: Radioactivity contaminated animal carcasses or body parts usually resulting from animal research. Animal carcasses present a special storage problem in that they often require freezing to inhibit biological degradation.

Aqueous Liquids: Wastes that are dissolved in water. Liquid waste must be solidified before shipment to a disposal facility. Liquids cannot be accepted for disposal.

Ash: Incinerating LLRW results in substantial volume reduction but most of the radioactivity is still present in the ash. Ash is often solidified with cement, asphalt, or other material prior to disposal or storage.

Biological Waste: Other biological waste may include animal bedding and excreta and laboratory culture media.

Contaminated Hazardous Material: Wastes that have hazardous constituents or properties as designated by the U.S. Environmental Protection Agency or the Michigan Department of Environmental Quality regulations as well as contamination with radionuclides. This type of waste is also referred to as "mixed waste."

Dry Active Waste (DAW): Solid waste that commonly consists of protective clothing, glassware, paper, cloth, and plastics that may have been contaminated with radioactive material. Some DAW can be compacted or incinerated.

Evaporator Concentrates: Evaporation of contaminated water is a common treatment method at nuclear power plants. The concentrated residue produced during the process is solidified before disposal.

Ion Exchange Resins: Organic polymer materials used to remove radioactive contaminants from circulating cooling water and used for other water treatment systems within nuclear power plants.

Liquid Filter Media, Cartridges: Filters or filter media used to remove radionuclides from water.

Medical Generators: A commercially available device used to create a short-lived radionuclide (to be used in a medical application) from a parent radionuclide. The most widely used medical generator is used to produce technetium-99m from a molybdenum source. The device is usually returned to the manufacturer at the end of its useful life.

Oils: Lubricating or machine oil that has become contaminated with radioactive materials.

Organic Liquids: Chemical compounds such as alcohols or solvents such as benzene, xylene, and toluene that have been contaminated with radioactive materials.

Rubble, Sand, and Soil: Concrete, gravel, soil, or other building rubble contaminated with radioactive materials. These wastes are usually generated in the process of decommissioning a licensed facility.

Sealed Sources: A radioactive source sealed in a container to prevent contact with, or dispersion of, the radioactive material during its use. Sealed sources are used in a wide variety of medical, research, industrial, and construction applications.

Sludge: Produced when filtering contaminants, sludges include powdered ion-exchange resins, diatomaceous earth, suspended solids, silica, and metal oxides.

TENORM: Technologically-Enhanced Naturally Occurring Radioactive Material results from naturally occurring radionuclides being concentrated by some man-made process. For example, radium scale can develop on oil and gas well piping.

Appendix C

LOW-LEVEL RADIOACTIVE WASTE AUTHORITY
LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT SURVEY

For Calendar Year 2006

Under Section 18(a) of Act 434 (P.A. of 1994), generators of low-level radioactive waste (LLRW) are required to provide information to the Michigan Low-Level Radioactive Waste Authority on an annual basis, or as required by the Authority. Information requested includes waste volumes, curie content of the waste, and other data relevant to waste management and disposal. This survey will fulfill the generator's reporting requirements for calendar year 2006.

This survey is due July 13, 2007

If you have any questions concerning this survey, contact Thor Strong, Acting Commissioner of the Michigan Low-Level Radioactive Waste Authority, at 517-241-1252. (strongt@michigan.gov) or T.R. Wentworth at 517-241-1438 (wentwort@michigan.gov).

Please provide the following information (* required):

* *Facility Type:*	Academic
* *Facility Name:*	
* *Facility Address 1:*	
Facility Address 2:	
* *City:*	
* *State:*	
* *Zip Code:*	
* *County:*	Select County Below
* *Contact Person:*	
Title:	
* *Daytime Phone:*	
E-mail:	
If other facility locations are included in this responses, please list them in the spaces here:	

1. If your facility has a U.S. Nuclear Regulatory Commission (NRC) License Number, please enter that here. If all radioactive materials are possessed under an NRC General License, indicate "GL":

2. Do you generate LLRW which, due to short half life of isotopes, may be stored for decay and eventually disposed as non-radioactive waste?

For all remaining questions, DO NOT include: 1) waste that is stored for decay which can then be disposed as non-radioactive waste; 2) sealed sources which can be returned to the manufacturer

3. A. In 2006, did your facility generate radioactive waste which requires disposal in a licensed LLRW disposal facility?

B. Do you anticipate generating LLRW in the future?

C. Is your facility storing any radioactive material or waste, generated prior to 2006, which is now awaiting disposal?

*If you answered "**NO**" to 3A, 3B* **AND** *3C, it is not necessary to complete the rest of the survey. Please click the "submit" button at the bottom of this page.*

*If you answered "**YES**" to 3A ,3B,* **OR** *3C, please complete all remaining questions that are appropriate and applicable.*

WASTE MANAGEMENT

4. A. Please estimate the volume of LLRW generated in calendar year 2006 that has been disposed, or will require disposal, in a licensed disposal facility. **Note: The sum of the entries below should equal the answer in question 4A.**

Total Cubic Feet

B. If known, break down the total volume entered in 4A into waste classes. Appendix 1 provides a description of waste classes.

Class A **Class B** **Class C** **Mixed** **Don't Know**

5. Use the following table to characterize the LLRW generated in calendar year 2006. Please indicate the volume, total activity and principle radionuclides for each waste stream that has been disposed or will require disposal in a licensed LLRW facility. The estimated volume for all waste streams reported should equal the total cubic feet volume reported in 4A. Click here for a description of waste streams.

A.	Dry Active Waste	K.	Rubble, sand, soil etc.
B.	Medical Generators	L.	Sludge
C.	Aqueous Liquids	M.	Evaporator Concentrates
D.	Organic Liquids (not oils)	N.	Air Filter Media, Cartridges
E.	Oils	O.	Liquid Filter Media, Cartridges
F.	Animal Carcasses	P.	Ion Exchange Resins
G.	Biological Waste (exclude animal carcasses)	Q.	Sealed Sources
H.	Ash	R.	TENORM
I.	Activated Equipment or Shielding (radioactive by irradiation)	S.	Other (describe)
J.	Contaminated Hazardous Material		

Waste	Estimated Volume	Total Activity	Principle Radionuclides

6. Please estimate the volume (in cubic feet) of LLRW that your facility will generate in each of the next five years. If you are unsure of Waste Class, enter as Class A.

	2007	2008	2009	2010	2011
Class A					
Class B					
Class C					
Mixed					

7. Check each waste management method currently used, either by you at your facility, or by an off-site waste processor, to manage your LLRW

- ☐ Decay to background
- ☐ Return to manufacturer or supplier
- ☐ On-site incineration
- ☐ Off-site incineration
- ☐ Controlled release pursuant to 10CFR20
- ☐ Refrigerated or frozen, prior to disposal
- ☐ Non-compacted prior to licensed disposal
- ☐ Compacted prior to licensed disposal
- ☐ Solidified prior to licensed disposal
- ☐ Dewatered prior to licensed disposal
- ☐ Curtailment of LLRW generation (elimination or substitution of activities previously generating LLRW)
- ☐ Off-site treatment with return for storage
- ☐ Brokerage storage for decay
- ☐ "Green is clean"
- ☐ Other (Please describe)

8. If your facility uses a waste brokerage service (a company which packages and collects waste) so that you do not have to deal with a disposal site directly, please provide the name of the company(s) and the state(s) where the broker(s) is located

9. If your facility shipped waste off-site for treatment or processing prior to disposal (incineration, compaction, etc.), identify the waste processor(s) and the state(s) where the processor(s) are located.

WASTE DISPOSAL

10. Please estimate the volume of waste shipped for disposal (either directly or through a broker or processor) at a licensed LLRW disposal facility in calendar year 2006.

Total Cubic Feet

11. Please identify the volume (in cubic feet) of waste sent to the following disposal sites during calendar year 2006:

Energy Solutions, LLC (Barnwell, South Carolina)

Envirocare of Utah, Inc. (Clive, Utah)

U.S. Ecology (Richland, Washington)

Other (please identify)

Don't know

WASTE IN STORAGE

12. A. Please estimate the cubic feet of LLRW, currently in storage, that will require disposal in a licensed LLRW disposal facility.

Total Cubic Feet

B. If known, break down the total volume entered in 12A by waste class.
Note: The sum of the entries below should equal the answer in question 12A.

Class A **Class B** **Class C** **Mixed** **Don't Know**

C. What percentage of the waste in storage was generated in calendar year 2006? **%**

13. What difficulties, if any, are you experiencing in your effort to ship stored wastes for disposal? Please explain:

14. The Energy Solutions disposal facility in Barnwell, S.C. will cease accepting waste from Michigan generators in July, 2008. This facility is currently the only option for disposal of Michigan's Class B and C wastes. Please explain any impact this loss of access will have on your facility and any steps being taken to address the issue

15. Please provide any other comments or explanations that will help us understand your responses to this survey, or any other information you wish to share with us.

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